

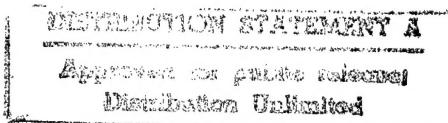
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JPRS-UMM-84-016

6 September 1984

# USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT



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6 September 1984

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MACHINE TOOLS AND METALWORKING EQUIPMENT**

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## INDUSTRY PLANNING AND ECONOMICS

### RAPID GROWTH OF MOLDAVIAN MACHINEBUILDING INDUSTRY VIEWED

Kishinev SOVETSKAYA MOLDAVIYA in Russian 13 Jun 84 p 2

[Article by the Central Statistical Administration of the USSR Council of Ministers in the column "Facts and Figures To Help the Propagandist and Agitator": "Machinebuilding"].

[Text] An outstanding achievement in the republic's social and economic development during the years of Soviet rule has been the creation of a machine building and metalworking industry. Moldavia, importing all industrial products, including the very simplest, in the not too distant past, today produces for export alone more than 300 kinds of machine building products, which are delivered to 65 countries of the world.

The shaping of the republic's modern machine building complex has been determined, on the one hand, by All-Union division of labor requirements and the differentiation of machine building as an industry to the scale of the country as a whole; and on the other, by the republic's overall economic development problem and the necessity of full and efficient use of its labor resources and acceleration of scientific and technical progress. Today, machine building is the most dynamic industry. During the years 1961-1983, the production output volume of machine building and metalworking increased 33-fold. Now the industry produces in one day almost six times as much as during all of the year 1940. Not one other industry of the republic has known such rapid rates. On this basis, the share of machine building and metalworking in Moldavia's output of industrial products has increased sharply--from 7 percent in 1960 to 14.5 percent in 1983.

Over 100 plants and associations of the electrical engineering, instrument building, machine tool building and chemical and petrochemical machine building industries are included in the republic's machine building complex, and a lot of the industry's plants produce products for the agro-industrial complex and consumer goods. The republic's machine building plants--these are large factories, supplied with modern equipment and progressive technology permitting them to ensure a high labor productivity, which has increased more than five-fold as compared with 1960.

The creation of machine building in the republic during such short periods of time became possible due to the sisterly help of all the Union Republics with

equipment, technical documentation and designs for plants, and with the provision of aid in plant construction, mastering the technology and training qualified working and engineering personnel. The establishment of many new factories was a direct result of implementing specialization to the country's scale.

The Kishinev Tractor Plant is a living personification of the brotherly co-operation of our country's peoples--the only plant in the country specialized in the output of sugar beet tractors. Equipment for it came from 267 plants in 70 cities of the country. The output of all five sequential models of Moldavian caterpillar tractors is put in working order with the participation of tractor builders from Russia, the Ukraine and Belorussia. The first Moldavian tractor came off the assembly line in September 1960, and today the plant turns out more than 10,000 of them annually. They go to many Union Republics.

One of the pages in the annals of the friendship and help for one another of our country's peoples may be credited with complete justification to the Tiraspol Casting Machines Plant imeni S.M. Kirov. This first-born of Moldavian machine building, the same age as the republic, was created and turned into the largest plant with the help of many peoples of our Soviet homeland. Workers of the Urals sent the first machine tool here. After that, equipment began to arrive from other plants of the Russian Federation and the Ukraine. Therefore, the output of the first elevating grader in the country at Tiraspol signified a labor victory for machine builders of the whole country.

The plant was destroyed during the fascist occupation; and once again, adhering to the laws of brotherhood after Moldavia's liberation, Muscovites and people from the Urals, Siberians and workers from Central Asian Republics sent machine tools and instruments to Tiraspol. Since that time, the reborn plant has been expanded several times and its equipment has been improved. Now it is one of the largest plants in the country in terms of output of casting equipment adaptable to modern production methods. Casting machines and automatic production lines for precise casting with the trademark "Litmasha" are in operation at such giants of Soviet industry as Moscow ZIL [Automobile Plant imeni I.A. Likhachev], the Volga Automobile Plant, KamAZ [Kamskiy Automobile Plant], the Chelyabinsk Tractor Plant and others.

Machine building plants constantly increase and modernize the assortment of products being turned out. Series production of 70-80 new types of machines, equipment and instruments is organized annually. Machine building plants make a large contribution to consumer goods production in the republic--they turn out over 200 kinds of such goods, including washing machines, refrigerators, general purpose home woodworking machine tools, electric toasters, electric irons, household electric pumps, radio equipment and others.

During just one day, the republic's machine builders currently produce 271 centrifugal pumps, 148 alternating current electric motors, 28 tractors, 95 motor vehicle trailers, 721 washing machines, 535 refrigerators, 59 magnetic tape recorders and many other kinds of products.

Development of the machine building industry ensures the solution of a number of the economic and social problems most important for the republic. Advancing as the bearers of scientific and technical progress, its plants provide the best conditions for training highly qualified working class and specialist personnel, designers, engineers, technicians and so forth. Today these processes have enveloped the republic's regional centers as well, where large, independent machine building plants or their branches have been created. At the same time, the chances for overall development of the populated places where such plants are placed also are increased.

Machine building is developing at leading rates in the 11th Five-Year Plan, too. Such large enterprises as the Kishinev Television Plant and the Beltsy plant for producing assemblies for tomato-picking machines and machines for harvesting vegetables and cultivating and picking tobacco are being constructed. A number of machine building plants is being expanded and reconstructed. These are practical steps in implementing the resolutions of the 26th CPSU Congress and subsequent Central Committee plenums of our party aimed at dynamic elevation of the economy and decisive shifting of production onto the path of intensive development.

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INDUSTRY PLANNING AND ECONOMICS

IMPACT OF ECONOMIC EXPERIMENT ASSESSED AT ELEKTROSTAL' TYAZHMASH

Moscow SOVETSKAYA ROSSIYA in Russian 17 May 84 p 2

/Report from the Moscow Order of Lenin Electric Furnace Steel Heavy Machinebuilding Plant by SOVETSKAYA ROSSIYA special correspondent N. Tyurin in the column "Economics: The Logic of an Experiment:" "The First Turning Point"/

[Text] Among these plants, the operation of which our newspaper is examining in terms of a large-scale economic experiment, is the Elektrostal'tyazhmash /Order of Lenin Electric Furnace Steel Heavy Machine Building Plant/ Production Association. In the report, "Room for Inquiry" (SOVETSKAYA ROSSIYA of 4 January this year), there was an account of how the machine builders collective was preparing itself for an important undertaking, and the kinds of expectations it attached to an envisaged experiment--broadening plant rights in planning and management activity, and increasing responsibility for the results of its labor. The first quarter of the year has passed--/and with it/ the initial phase of the experiment, aimed at uniting as firmly as possible the interests of the individual, the collective and society. How are things now at EZTM /the Order of Lenin Electric Furnace Steel Heavy Machine Building Plant/?

The very first impression, still unsupported by figures and other arguments, is: Like a traveler afoot, who has made it to the top of a steep upgrade, the plant is breathing with an obvious sense of satisfaction. And this is understandable, for the first step in a large, important itinerary is always difficult, and the more so because there is a need to cross the boundary line separating expectation from realization. But it became clearer with the passage of every 10 days--the plant would fulfill the plan. And this was ever so important after several not too successful years for the plant. Moreover, the prestige of the experiment passed the first test. They knew at the plant: a firm belief in success was necessary for all of the experiment's participants.

When the quarter was reviewed, it became apparent that a business-like attitude, plus a set of specific steps, gave extremely convincing results. The plan for increasing labor productivity was overfulfilled appreciably. Best of all, the association successfully met its

contractual obligations, and metallurgists in our country and abroad received in full the equipment they needed with the trademark EZTM. In this way, the machine builders showed themselves and others that the main objective of the broad-scale economic experiment--to increase the initiative and responsibility of production workers sharply--is fully attainable.

However, we should not be hasty with the victory reports--this is not only an insistent request of Electric Furnace Steel people, but everyday common sense as well. It was not for fireworks that this most serious experiment was begun in five branches of our industry. A model of economic control, which will work everywhere in its essentials, will have to be devised. This means that it is important to know today all results the experiment produces, without exception; and here the negative indications are no less important than the positive. When you delve into Electric Furnace Steel Machine Building report documents, talk with people in a shop, and attend management control conferences, you understand more clearly the justification for a conclusion reached by the association's management: The success of the first quarter depended not only upon the terms of the experiment, but also upon preparation for it. How and why did this conception arise, and what confirmed it? Here are some of the most characteristic conversations with workers of mechanical assembly shop number 3--typical for EZTM subdivisions turning out finished products.

Anna Danilovna Uspenskaya, marker: "I have been in the plant for 30 years, but I do not remember castings ever coming so fast and furious. It is very exciting here now. And the feeling from completed work is entirely different because whether or not the machine tool operators have the set of items they needed tomorrow depends upon you, personally. In such a case, you try with all your might. And what was noted of our efforts was--twice as good...."

Anatoliy Pavlovich Zaytsev, shift foreman: "Three things are necessary for a high /productivity/ index--a sufficient quantity of material, equipment in good working order, and conscientious workers. The last depends directly upon the first two. We had all of them in the quarter just ended. Insofar as the new requirements regarding the mandatory products list are concerned, the machine tool operators understood and accepted them. There is a fitting rule for this: If the job is done according to the list of essential parts, you may count with certainty upon a reward, and if not--too bad...."

Anatoliy Konstantinovich Okolyshev, deputy shop chief for production. "Since January, the approach to the plan has been changed drastically. Whereas before it was entirely sufficient to fulfill the plan in 'naked tonnage,' not asking oneself where and when those tons of equipment were to go, we now answer those questions first of all. Shifting the products list around is permitted only within limits of the quarterly contracts. The new incentive system, which is directly

aimed at tightening delivery control, is very helpful, but it would have hung in mid-air if the plant's casting and forging subdivisions had not worked it out properly."

Thus, two factors primarily assured success: The steady work of the casting and forging shops, and the correctly applied right of the plant to make good use of wage fund economy on its own. Nothing essentially new happened in the casting and forging subdivisions. There simply began to be a return from the persistent efforts here, aimed at tightening up organization and good order. And then each shop was allotted its quarterly wage fund, plus the right to spend 70 percent of its savings on economic incentives for its leading workers--This is the experiment in action. It is thought that there is a strict consistency in the interlacing of these two factors: Not a single effective planning method, however,desirable, will work out without appropriate provision of the "crude prosaic sides" of production--the initial materials and the means to do the work. On the other hand, we know a great number of situations where everything necessary for an excellent and result exists, but there is no driven mechanism--no system of indices bringing metal, skills and will into motion. It turns out that the Electric Furnace Steel Machine Building collective took the right road in the first quarter--not expecting miracles from the experiment, but releasing its creative potential by persistent everyday work, especially in the inveterately "narrow-minded" sectors.

About 500 workmen, engineering and technical workers and office employees of the plant were authorized to receive a special payment in addition to allotted salary or rate of pay, which will be effective for the duration of the second quarter. Its magnitude is from 15 to 40 rubles and, if you take into account that the permanent, basic salary on which the bonuses are based increases, then this incentive is appreciable. Where did the collective get the means to give such an incentive? Solely through quality work: The entire increase in normative net production volume was obtained by an increase in finished quarters? Certainly, provided there are savings in the wage fund. Can the number of workers enjoying the additional payments grow, and the size of the incentive be increased? They can, and they must, if the collective meets its obligations to customers in the future also.

And here we have entered a region of prognoses and problems which still await resolution. Whatever may be said, a weight has been snatched at Electric Furnace Steel, after which there will be... A slump, or a steady movement confident of its powers? A great deal depends upon the collective itself, but not everything. What primarily causes anxiety today?

Just as in previous years, it is material and technical supply and, above all, the delivery of rolled metal stock. There are no words

for it. Measures taken by the USSR Gossnab /State Committee for Material and Technical Supply/ have made procedures frustrating in this most important sphere for machine builders. According to the evaluation of Viktor Bokchunovich Li, deputy plant director in charge of external cooperation, it has become easier to breathe; but this condition has been achieved by means of "bunching" deliveries (a term coined by Gossnab workers) in the first quarter. More plainly speaking, they managed to transfer quite a bit of metal from months following March by hard-nosed negotiations and orders stamped "experiment." How this will pan out in the future is not yet known.

No, I did not bring up the supply problem for the sake of rehashing "unresolved issues." A priceless quality has appeared at EZTM, and it is growing and becoming stronger--a feeling of self-respect, without which work demanding initiative is, in truth, hardly possible. Responsibility, as you know, is directly proportional to a person's or a collective's potential to affect a process for which there is demand. Today the plant has the majority of the components of work demanding initiative in hand, and it would be a great pity to dismantle this not uncomplicated, sorely needed and barely begun structure to one extent or another. Dismantling can be avoided, although there exist more than enough obstacles to avoiding it.

Initial data concerning the formation of production development and sotskul't-byt /sociocultural facilities/ funds seriously worry the EZTM administrators and, of course, those of Mintyazhmash /the Ministry of Heavy and Transport Machine Building/, too. Importance of the funds can hardly be exaggerated: The first is for systematic technical reequipment in production, and the second for the plant's housing infrastructure. Where is the problem? At the beginning of the experiment, the plant's funds were too limited to permit its making readjustments immediately, within the allowance established by the ministry, in the spheres most important for itself. The alternatives appeared to be: Either wait in the course of the next few years because of housing shortages and slow rates of modernizing production, or request a subsidy from industry headquarters. But is it not better to temporarily increase the standard deductions from profits for a strictly fixed period of time, and then pay off the state by an increased share in its budget?

A second example is from a sphere where a normalized economy exists, as they say, halfway.... I refer to the agricultural work mandatory for machine builders as well as for thousands of other industrial collectives. At present only one standard operates here: The phone call of the kolkhoz chairman or the sovkhoz director to the party gorkom with the request to help out with people. And people go, "stealing" from the shops and KB's /design bureaus/ no small share of normative net production and the wage fund. No doubt it is necessary to help agriculture; but should we now not test out in the Moscow vicinity, under experimental conditions, the system of contracts

between farmers and a plant that was recommended rather highly in the Ukraine? Then the demand and the billing for it would be much more in line, and State and private rubles safer and sounder.

As we see, the experiment, in one way or another, seems to involve collateral, but extremely important, factors. However, such is the logic of a large-scale undertaking: The first impulses rejecting stagnation and the routine entail one new thing after another. These days, important Gosplan, Gossnab, ministry and Moscow Party Obkom workers often visit the Electric Furnace Steel Machine Building. Their help is useful and highly valued, but the problems arising today urgently demand the intensified efforts of all who are participating in the experiment in one way or another. The important matter is of joint concern.

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## INDUSTRY PLANNING AND ECONOMICS

### BUILDING AS KEY TO INDUSTRIAL MODERNIZATION

Moscow PRAVDA in Russian 17 May 84 p 2

[Article by Minister of the USSR Machine Tool and Tool Building Industry B. Bal'mont in the column "Avenues of Technical Progress": "The Wellsprings of Modernization"]

[Text] In K. U. Chernenko's speech at a meeting with voters of Moscow's Kuybyshev Electoral District, it was noted that it is necessary to ensure the swift and continuous modernization of all sectors of the national economy on the basis of contemporary achievements in science and technology. This is one of our fundamental tasks. Without it, the progress of society is simply inconceivable.

We machine tool builders consider that these words were addressed directly to us. Indeed, genuine modernization is possible only on the basis of advanced machine building, and successes of the latter are determined in the first place by a preeminent development of machine tool building.

Our industry now has one of the main and basic ones in the national economy. Machine tool builders are striving to supply the economy with automated systems capable of increasing the labor productivity of every worker, and they are achieving effective utilization of their own production potential.

An international exhibition, "Metalloobrabotka-84" [Metal Working-84"], was held in Moscow during March and April with the participation of more than 500 firms from 22 countries. It visually presented the achievements and potentials of world machine tool building, including the Soviet, and this primarily in solving the problems of automation. We were pleased to confirm that Soviet machine tool building does not fall below the world level in a single one of the latest trends.

Our machine tool building industry is continuously increasing the level of automation in machine tools and machines being produced. The variety of equipment with programmed control is expanding rapidly, and automated machine tools and machines are being developed for all kinds of technological processes used in machine building.

For series and small series production, which constitutes about three-fourths of the production in machine building, our industry is increasing the output of machine tools and machines with numerical programmed control (ChPU), automatic production lines, robots and robotized systems, and flexible production modules and systems. The output of manually controlled equipment is being steadily reduced. Thus, in the current year, while there will be an overall reduction in the quantity of metal-cutting tools being manufactured, the output of machine tools with ChPU, for example, will increase by a factor of 1.8, that of "machining center" type machine tools by a factor of 2.5 and that of automatic machine tool lines by a factor of 1.5, as compared with 1980.

All our consumers are counting heavily upon this output. Suffice it to recall, by way of illustration, that in work on a machine tool with numerical programmed control, labor productivity immediately becomes two to four times greater than on the customary universal machine tool. Machining centers, which are multi-operational machine tools permitting accomplishment of an entire set of operations in the machining of parts, bring about an especially steep rise in labor productivity.

The "brain" of machining centers consists of programmed control systems based upon microprocessors and micro-EVM [electronic microcomputers]. A number of domestic factories of the electrical engineering, instrument building and electronic industries now have mastered and are turning out new types of such systems. This has enabled our machine tool builders to set up series production of machining centers, equipped entirely with domestic component devices, in Moscow, Leningrad, Gomel, Vitebsk, Odessa and other cities of the country.

The output of flexible production systems (GPS), which provide for minimal human participation in a technological process, has begun in the industry. The system developed by the Ivanovskiy Machine Tool Building Association may serve as an example. This GPS, with the interim name "Talka-5000," manufactures stationary parts of machines by "humanless" technology in conditions of small series, wide variety production. The system raises labor productivity to more than twice that with traditional machining of parts.

It should be noted that flexible systems have great effect only with their full two or three shift utilization and good operation. Our consumers have no right to expect the full socio-economic effect from expensive equipment with numerical programmed control if they do not utilize it fully and do not set up production training. Unfortunately, this still takes place in Ministry of Power Machine Building plants and plants of certain other ministries, in which the shift coefficient for operating machine tools with numerical programmed control was 1.2 to 1.3 last year. At the same time, more and more new orders for such machine tools are coming in from these ministries.

Automation in large series and mass production is based, as before, upon broad applications of automatic machines, transfer machines, special purpose machines and automatic machine tool lines. Last year, for example, a flexible, resettable automatic line for machining screw [rotational] compressor parts of four kinds and seven standard sizes was manufactured by the Moscow "Stankoagregat" [Machine Tool Assembly] and "Stankokonstruktsiya" [Machine Tool Construction] factories.

Our sub-industries such as forging and pressing and foundry machine building also are turning out more and more automatic machines. Thus, for example, the Azov SKB [Special Design Bureau], together with the Salsk Forging and Pressing Equipment Factory, developed an automated system which includes a press with 63 ton-force capacity and magazines for storing 16 dies and blanks. Such a system makes it possible to replace nine universal presses and reduce technological training time. Another example: The Tiraspol Foundry Machines Factory imeni S. M. Kirov mastered the output of clustered casting sets which make it possible fully to mechanize and automate the manufacture of aluminum alloy castings.

For further automation of metal working equipment, much more depends upon the cooperating supplier industries--the Ministry of Instrument Making, Automation Equipment and Control Systems; the Ministry of the Electrical Equipment Industry; and the Ministry of the Electronics Industry. They create the modern control systems for assemblies produced by our industry. The main thing is to increase the reliability of this complicated technology and equipment.

Life today demands of designers and technologists a radical departure from traditional forms of work. It is necessary in life now to depend, not upon the Kuhlman drafting unit and pencil, but upon electronic computer technology. The latter must permeate the entire birth sequence of the new technology--from conception to production. Our industry is devoting great attention to introducing automated designing systems (SAPR) and automated technological processes control systems (ASUTP). Research operations, engineering computations and the planning and development of technological processes are being automated in a number of special design bureaus, institutes and factory KB [design bureaus]. However, in order to expedite this work it is necessary to increase the manufacture of computer systems, visual display units, plotting devices and other special equipment in the country.

The newest machine tools and equipment being put out by the industry substantially change the characteristics of human employment. Only specially trained workers and qualified specialists can operate them effectively. Such specialists now are being trained in a number of PTU's [vocational and technical schools], teknikums and institutes. However, both this training and the provision of equipment to the educational institutions obviously are insufficient in magnitude. It is necessary to invite attention of the machine building ministries, Minvuz [the Ministry of Higher and Secondary Specialized Education] and Gosprofobr [the State Committee for Vocational and Technical Education] to solve this problem.

Experience has shown that many organizations and plants of the machine building industries, upon receiving the new equipment we turn out, take its great advantages insufficiently into account, and do not always solve the problems of technical training for its use in a system. But it now is necessary to devote the most serious attention to these problems. We must not lose sight of the fact that the technology and equipment now being planned and developed will determine, in many respects, the technical level of machine building in the 1990's. In our opinion, we should be guided by this fact, creating new production entities, devising projects for redesigning and technically re-equipping plants.

Crucial tasks confront machine tool builders. For the year 1984 they accepted the socialist obligation to raise the shift coefficient for basic equipment operation from 1.36, as it was at the beginning of the year, to 1.5. In store for us is modernization of the equipment in operation at a more accelerated rate and ridding plants of worn-out and obsolete machine tools and machines. For the industry as a whole, it is tentatively intended to release about 26,000 persons during the remaining 2 years of the five-year plan. The proportion of multiple machine tool operators within the overall number of workers will increase from 20.2 percent in 1980 to 23.3 percent by the end of the five-year plan.

An overwhelming majority of the industry's plants now will provide the entire increase in production output volumes without increasing the number of workers. For the ministry as a whole, the part of the increase in production volume attributable to increasing labor productivity was 87.8 percent in 1982, 95.6 percent last year and 100 percent in the first quarter of the current year.

According to the most important index--growth of labor productivity--the prescribed assignment and accepted socialist obligation were overfulfilled during 4 months of the current year. Labor productivity grew by 7.9 percent, while the plan called for 5.2 percent. The socialist obligation for additional reduction in the cost of production by 0.5 percent in the first quarter also was met.

We are aware of the responsibility placed upon our industry for modernizing the equipment inventory of machine building and enriching that inventory with automated equipment, industrial robots and flexible production modules and systems. The collectives of all of the industry's NII [scientific research institutes], design and technological organizations and production plants have been mobilized for work on this general task.

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CSO: 1823/270

INDUSTRY PLANNING AND ECONOMICS

ATTRITION PROBLEM OF UNDERQUALIFIED MACHINISTS ADDRESSED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 Apr 84 p 2

[Article by N. Gordeyev, deputy general director of the association "Krasnodar Plant for Measuring Instruments": "They Remain on Line"]

[Text] More than 200 workers formalize their pensions at our plant every year. As a rule, they are accomplished masters at their own work, people with authority and tremendous professional and life experience. The young people who come in their place cannot always and everywhere replace the veterans painlessly for production, but the main thing is that there quite simply are not enough new workers.

Naturally, the basic way to alleviate this problem is through widespread automation and mechanization of production. But it seems to forget about veterans who can keep on working if given a chance. I will relate what we are doing at the Krasnodar Plant for Measuring Instruments.

For many veterans, the formalizing of a pension does not mean leaving the enterprise. About one in four stays at his former job or at another one that suits him. And to this day, the builders of the 1930's V. Golubotskiy, P. Smutnyy and A. Kolesnikov are working side by side with us. They long ago passed pension age but cannot imagine their lives without the familiar collective. They are energetic in their work and active in public affairs.

Today more than 900 pensioners work at the main enterprise alone. That is one in ten workers. And our calculations show that the output from their work is considerably greater--one-fifth of the entire production volume. What attracts them, the wage? Another R120 to R150 in addition to the pension is not a hindrance but it is not just a matter of money. Solid and deep roots link the fate of a person with that of a plant to which one's best years have been given. Here he feels useful and tries to apply his entire experience and knowledge to the common good. I will speak of just a few of these people.

S. Buturlakin, veteran of war and labor, enjoys a good reputation at the plant. For a quarter of a century, he has been working as a fitter and electrical installer in the shop for mechanization and automation of production processes. He is characterized by conscientiousness, a feeling of great responsibility and the ability to finish what he starts. He was

awarded the Order of Lenin for his selfless labor. Young people come to him often for advice and help. He knows how to listen to each of them with understanding. For many consecutive years, shop communists have been electing him as their leader.

Another version is A. Kitsn, a lathe operator in the same shop and a cavalier of the order "Badge of Honor." His lathe turns out the most "delicate" parts. He is respected as one of the best mentors of young people. Under his leadership, 18 people mastered the difficult occupation of universal lathe operator.

Fitter-mechanic M. Lukoshkin, cavalier of the Order of Lenin and participant in the defense of Moscow, has been working in the experimental shop for almost 40 years. He is entrusted with putting the most complicated instruments into working condition, knowing that they will correspond to the class of accuracy and all parameters set by the designer. M. Lukoshkin led the primary party organization for many years and now he is actively participating in the supernumerary party commission.

The dearest thing for an older person is attention. Unfortunately, at times that is just what is lacking. It still frequently happens that qualified workers are light-heartedly sent to rest and then there is a feverish search for anyone at all to replace him. Why does this happen? Apparently because it is simpler to refer to a shortage of personnel than to solve the problem. And it is a complex problem indeed.

Instructions now in effect, for example, provide orientation to physicians of the VTEK [Medical-Labor Commission of Experts] for only certain degrees of work disability. But who, pray tell, can give a qualified appraisal of the potential abilities of a pensioner? In my view, it is expedient to entrust the VTEK with obligations not only to attest to disabled persons but also veteran workers, issuing recommendations for their rational job placement. By considering these recommendations, it will be easier for personnel departments to find a suitable workplace for a veteran worker.

Many veterans return to the plant after a certain time asking that they be given somewhat easier work. The time has come for the enterprises to put out information bulletins for pensioners with a list of occupations and an indication of jobs where they can work. At our main plant, for example, conditions are being created for suitable work. They system of the partial workday or workweek is applied, as in the sliding or flexible schedule. In thisway, we plan to "hold" half of pensioners in production. And for those who need rest beyond the basic vacation, a supplementary period is provided, without maintenance of salary. They are given material aid along with their health resort documentation or travel authorization. If for some reason a veteran worker cannot work in the shop, we give him work at home. For if desired it will always be possible to find operations that can be performed at home with the aid of simple accessories. For example: fastening straps, putting together simple packages, cleaning components and hand adjustment and preparation.

According to forecasts, in the 1980's the number of pensioners will grow faster than the able-bodied population. That means that even now it is necessary to seek ways to attract them to socially useful work. The resulting curious scenario: every Friday hundreds of factory workers leave their drawing boards and machine tools and set off with shovels and brooms to clean up the consolidated territories, the squares, roads and housing blocks. Important work. But here on the benches sit groups of vigorous veterans keenly controlling the cleanup. A legitimate question is why not use their help to organize the cleaning and maintenance of their own yards and adjacent streets in a respectable and sanitary condition? How much does the plant lose in these cleanups, how many overtime hours is it forced to "seize"? I believe that many pensioners would not refuse to participate in this work if they could be interested.

It is our common interest to do everything to prevent the interruption of the bond between the collective and people who have reached pension age. This is a large reserve for alleviating the problem of the manpower shortage, for strengthening discipline and for improving training work.

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CSO: 1823/288

## INDUSTRY PLANNING AND ECONOMICS

### AGING PRODUCTION PLANT STRUGGLES WITH DOWN TIME, ABSENTEEISM

Kiev RABOCHAYA GAZETA in Russian 25 Apr 84 p 2

[Article by RABOCHAYA GAZETA special correspondent A. Kovtun: "The Coefficient of Prestige"]

[Text] Lvov--At the No 10 shop at the Avtopogruzchik Production Association all the machine tools have been set up in rows. There are just a few six-spindle semiautomatic devices over in the corner, along with a metal grid enclosure. But the door is always open. Come on in, it says, take a look around, gain some experience. But do not be a distraction. Operators handling multiple machines are working here. Their time is measured not in minutes but literally in seconds.

Milling machine operator V.F. Krivoruchko is calmly, without fuss, walking from one machine tool to another. As he answers the questions he does not raise his gaze from the coldly gleaming billets. Vladimir Fedorovich is assigned the most complicated work, where special accuracy and high quality are needed. He fulfills his shifts quotas at least 140 percent. And Krivoruchko's machine tools work like clockwork; the repair people have forgotten how to find him.

For Vladimir Fedorovich it is difficult to believe that equipment at the plant is by no means always operated the way his is. He is very proprietary about his equipment. And not only him. Milling machine operators V.K. Nezhinskiy and A.K. Samar simultaneously handle operations at several semiautomatic tools.

Nevertheless, facts are facts. In the association the shift coefficient is only 1.42, while in ancillary production it is even less at 1.32. Compared with last year it has fallen. Moreover, this trend has been in evidence for a long time. The highest return from the inventory of machine tools was 13 years ago.

At that time the collective used to be mentioned in the same breath as well-known enterprises such as the Lvov Bus Plant, Elektron, Konveyer, and the Telegraph Apparatus Association. Now the Avtopogruzchik is named among the laggards. The impression is being created that the collective's prestige is falling in line with the coefficient of equipment utilization. The connection

here is a direct one. If a plant is always among the leaders people are eager to go there and there is enough manpower. And this means that the plan is fulfilled without any special stress, and equipment is used as it should be, in two shifts. At the Avtopogruzchik all the machines are operated for an average of only a little over 3 hours in the second shift.

In order to load them more fully the personnel department sometimes accepts those whom no one would bother with for very long. And again, at a loss to itself, that is, to the authority of the enterprise. Last year 9,000 cases of absenteeism were recorded at the Avtopogruzchik.

Yes, there is a shortage of workers.

The base vocational and technical school, however, strange as it may seem, is just making matters worse: for a year it has failed to train a single lathe operator, but instead graduates from its halls controllers for the department of technical control and fitters for automatic devices.

"We have no means of influencing them. The school is located in the Shevchenkovskiy Rayon of the city and the plant is located in the Zalizinskiy Rayon" the deputy director for personnel N.A. Strikharchuk explains.

Incidentally, in the party gorkom and in the oblast committee for vocational and technical training they are aware of the situation but, judging from everything, they are not about to change anything.

It is not, however, only a matter of personnel. A radical solution of the problem lies in production mechanization and automation. At Avtopogruzchik all hopes are on reconstruction, which has already been underway for several years. In essence, a complete plant with modern premises and mechanized lines is being built on new areas in the suburbs. Production of newly modified lift loaders is being located there. Suffice it to say that this production has been included in the "Trud" all-union program. Next year 25,000 of these mechanisms will be produced.

But of course, the old production facility is still equal to this. Small-series output and spares will be produced there. And the machine tools should operate at full capacity. This is what V.F. Krivoruchko and many of his comrades think. But the experience of the multiple-machine operators in the association is not being generalized, nor is an initiative to service several units together proposed by the workers themselves. Deputy chief of the labor and wages section, A.E. Gusarevich, is preparing a list of the multiple-machine operators, but it is difficult to say how many there are, many or few, and, in general, how many are needed.

There is yet another way of solving the problem, namely the brigade form of labor organization. You do not need to go far for examples. Way back in January the bottleneck at Avtopogruzchik was the assembly of hydraulic drives. The young communist Nikolay Vasil'yev proposed the organization of a brigade in that section. Now five men are coping with a volume that previously seven could scarcely handle.

There are 449 brigades in the association. But only one-tenth of them are cost-accounting brigades with distribution of wages according to a coefficient of labor participation. Half of them are brigades in name only.

We had occasion to be present at an interesting meeting in this same No 10 shop. The members of a future comprehensive, start-to-finish brigade in the hydraulics section were under discussion: lathe operators, milling-machine operators, fitters-and-assemblers. Responding to a suggestion by the shop chief V.F. Brizhatyy they agreed not to rush things. They discussed it: will we lose wages, will we have to work for such-and-such?... Businesslike suggestions were made: "Let us shift those two machine tools so that they are more convenient... Let us conclude an agreement with the preparation shop so that they let us down less often..."

Even though no specific decision was made the shop chief was satisfied with the discussion: there will be a brigade. Well then, the prognosis is good. As they say, better late than never. However, why is it only now that the discussions are taking place? Well, because previously "there was no need." But if V.F. Brizhatyy had started this, say, a year ago perhaps the collective would already have improved its position. But inertia intervenes and the habit of working in the old ways has its effect.

The same is seen with regard to leading experience. Thus, workplace certification at Avtopogruzchik has been done mainly "for show,"

The Ukrainian Communist Party Central Committee approved the initiative of the leading machine building collectives: "Maximum Return from Each Machine Tool." How was this initiative regarded at Avtopogruzchik? It was not. Nothing has yet been done.

The association director has been replaced several times in the recent past. The present director, Ya.M. Pidvalnyy, has set to energetically. For the first time in many years specialists at the association have analyzed equipment workloads and the workload balance. It turned out that stoppages occur most often because of the cast metal production facility. Shop capacity is, say, 5,309 tons annually for cast steel. Internal demand is 4,900 tons. It would seem that this should cause no particular problem. If 1,120 tons were not being delivered somewhere else. As a result of this, Avtopogruzchik's own orders have to be placed in other oblasts. Obviously the director should try more energetically to get a decision on the matter in the USSR Ministry of the Automotive Industry.

The indicator for equipment workloads is slipping, and the fact is that there is much obsolete equipment in the association. Some 27 percent of metal-cutting and 29 percent of forging and pressing equipment is 20 years old. Only under its new director has the association really started to renew its machine tool inventory. And NC machine tools have been introduced in the old production areas. The association's chief technologist, A.G. Mikhaylenko, fears that the presence of special equipment essential for technological reasons for making spares for loaders that have already been withdrawn from production will lower the shift coefficient. The workload coefficient for the special machine tool unit is 0.02, while for the bevel-removal tool it is 0.13 percent.

An answer can probably be found. In order to increase the workload of machine tools with a low shift coefficient it is necessary to get outside orders. It is troublesome, no doubt of it. But it is profitable.

Yes, many questions remain to be solved by the Avtopogruzchik administration and its new director. In the final analysis, they all boil down to making the collective work with the same kind of return that is achieved, for example, by Krivoruchko and Nezhinskiy. But, of course, an association is a mechanism that is rather more complex than even the most complex machine tool, and it must be adjusted with at least the same amount of care. This the administration must do, together with the party organization and with active help from the ministry.

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CSO: 1823/283

## INDUSTRY PLANNING AND ECONOMICS

### ARMENIA OPTS TO UPGRADE OBSOLETE MACHINE TOOLS

Yerevan KOMMUNIST in Russian 20 May 84 p 1

[Article by A. Gevorkyan, deputy editor of the rayon newspaper RAZDAN:  
"Conclusions Drawn"]

[Text] At the March (1984) Armenian CP Central Committee Plenum, the talk was that at many enterprises of the republic they are doing a poor job of increasing the machine shift coefficient. Among these enterprises is the Charentsavanskoye Instrument Production Association. Last year here, they not only did not reach the planned level but they even reduced that indicator relative to 1982. Under such conditions, it is very difficult to fulfill the party's additional target of increasing labor productivity by 1 percent and reducing the cost of production by 0.5 percent more than called for in the plan.

What conclusions were drawn from the criticism and what are the instrument builders doing to correct the situation?

Immediately after the plenum, a commission was formed here for the optimum use of the pool of machine tools. After studying the condition of more than 700 machine tools, the factory representatives came to the conclusion that some of them are obsolete. These must be replaced.

In accordance with the plan that was worked out, the disassembly of the worn-out equipment has already begun. Dozens of machine tools have been written off. Their number will increase by the end of the year.

Highly productive automated or semi-automated machine tools are taking the place of the obsolete and inefficient mechanisms. The association decided to push the further development of the movement toward having workers operate several machine tools simultaneously. The freed workers will move to other sections or to a second shift. Incentives for the assimilation of related specialties will also contribute to a full equipment workload.

Thanks to the measures taken, the machine shift coefficient has now increased to 1.24 compared to 1.09 last year, and by the end of the year it will reach the planned 1.34. Instrument builders decided to reach the level of 1.42 by the end of the Five-Year Plan. The maintenance of a rapid pace in carrying out the planned work will help to fulfill the additional obligations of the association collective.

## INDUSTRY PLANNING AND ECONOMICS

### INEFFICIENT CAPITAL EQUIPMENT UTILIZATION IN ARMENIA

Yerevan KOMMUNIST in Russian 31 May 84 p 2

[Article by V. Chalabov, candidate of technical sciences, "Search for Reserves"]

[Text] Recently a director of one of the machinebuilding enterprises in the republic, speaking to a representative of the main administration, complained about the shortage of metal-cutting machine tools and asked for help in obtaining at least two-three lathes. Surely, one thought: the shift coefficient at the enterprise was extremely high. But familiarizing oneself with statistics showed that this coefficient was considerably lower than average for the republic.

Regrettably, this case is fairly typical of many machinebuilding enterprises. Their managers complain of equipment shortage, but overlook the inefficient utilization of the machine tool park.

Recently considerable work has been done in the republic on operating at full production capacity and better utilization of metalworking and other equipment. As a result the shift coefficient at machinebuilding enterprises was 1.32 in 1973 as compared to 1.3 in 1980. However, 64.4 percent of the enterprises did not reach the planned level and, as a result, 1484 machine tool-shifts were lost. Taking this into account the shift coefficient in basic production would have been 1.48 instead of the 1.4 actually obtained, while for equipment as a whole, it would have been 1.38 as against 1.32.

Among organizations that have not achieved the planned level is the "Armelektrosvigatel'" PO [Production association], where the shift coefficient was 1.48 instead of 1.7 per plan; "Tekhosnastka" PO -- 1.31 and 1.51; the Yerevan Milling Machine Tool Plant -- 1.19 and 1.48; the "Armavto" PO -- 1.12 and 1.32 etc.

The shift coefficient of equipment operation in the republic as a whole lags significantly behind the average for the Union (1.45). Meanwhile, the significance of underutilization of reserves in this area is indicated by the fact that bringing this coefficient up to the average in machinebuilding of the sector for the republic as whole would make it possible to produce an additional output in an amount of tens of millions of rubles per year and,

for all other conditions being equal, this would mean raising the output capital ratio by more than 6 percent.

Some machinebuilding enterprises and associations of the republic have machine tool-shift coefficients of less than one. Thus, according to the TSSU [Central Statistical Administration] of the Armenian SSR, the following enterprises have a shift coefficient of less than one: the "Kristall" PO, the "Armkhimmash," the "Avtogenmash" Plant, the "Kamribor" Plant etc.

Due to the fact that enterprises do not fulfill set tasks on the equipment shift coefficient, output losses in the investigated enterprises alone were 64 million rubles per year which reduces the rate of increase in commercial output for the entire industry of the republic by one percent per year.

Of special concern is the insufficient loading of new, high productivity and expensive equipment. In particular, the shift coefficient of machine tools with NC is lower than the general indicator for all metal-cutting machine tools. Every seventh machine tool with NC stands idle in the production process, including multioperational ones -- every sixth.

What are the basic reasons for such a situation?

Our republic has tens of thousands of metal-cutting machine tools. Their number increases by hundreds every year. Once every two or three years, the statistical organs of the republic check on how metalworking equipment is being utilized in machinebuilding enterprises. What do they find? On the average, every machine tool operates less than a shift and a half. It is assumed that the main reason for this is the scarcity of machine tool operators. The conclusion is that it is necessary to train people to operate many machine tools. Regrettably, practice shows that this is not getting the proper attention at practically any enterprises. For example, Sergey Avakov, one of the best operator of many machine tools, worked at the Charentsavanskiy Tool Production Association. Regrettably, his experience did not benefit even the workers in the association.

The second reason is that planned tasks on industrial output do not provide for the full loading of the enterprise because of the necessity for their multiple corrections on the down side during the year, i.e., because of the disruption in planning discipline. Frequently, Union organs and Union republic ministries and departments reduce the plans.

However, the basic reason for the inefficient utilization of the machine tool park is hidden in the elementary lack of skill in organizing production.

Here is another side of the problem. Metal-cutting machine tools are basic producers of chips. Each ton of chips cost the national economy 640 rubles.

What does scientific-technological progress propose? Replace machining of the metal, for example, by precision stamping. Then, in processing every million tons of rolled stock we will save 250,000 tons of metal and free 20,000 workers. Both are extremely scarce. There is only one conclusion:

national economy interests demand that machinebuilding rebuild itself decisively for wider utilization of progressive technology and equipment corresponding to it.

Modernizing and reequipping of an entire sector is a difficult job. It takes time, thoughtfulness and painstaking work. At this modern stage of production and technological development, it is impossible to span all enterprises at once.

But it is possible to start with each ministry creating at least one standard production model and use it to teach people graphically.

At present, in the country, including our republic, according to the call of the party, great work has been done to find additional reserves and possibilities to increase the volume of production, raise labor productivity above the plan and reduce production costs. The realistic results of this patriotic initiative of working collectives depend greatly on a systematic, comprehensive approach to this work which should span all factors in the growth of the final production results, including measures to improve the loading of existing capacities, machines and equipment, to raise the shift coefficient of their operation because precisely in this lie huge reserves of growth and efficiency of production and productivity of labor.

The utilization of these reserves requires persistent strengthening of the work on balancing production capacities in all links of the technological process, the elimination of "bottlenecks" and the sale of surplus equipment, and the creation of all conditions to find workers for a full second shift, improvement in the operational-calendar planning, and improvement in the organization of labor and production.

At the January (1984) Plenum of the CP Armenia Central Committee, the necessity was pointed out for improving the utilization of the fixed capital for industrial production and ways were outlined for perfecting managerial-economic activity in this direction. This means primarily the elimination of shortcomings in design and construction, the observation of schedules for putting capacities in operation and mastering them, the creation of every condition for uniform, regular work.

To this must also be added the efficient utilization of production capacities, machines and equipment, raising the shift coefficient of their operation -- the most important reserve in the growth of industrial production and the increase in its efficiency.

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CSO: 1823/272

## INDUSTRY PLANNING AND ECONOMICS

### OUTPUT OF ADVANCED CONTROL, PRODUCTION SYSTEMS NOT MET

Moscow EKONOMICHESKAYA GAZETA in Russian No 16, Apr 84 p 1

[Unattributed article: "To Automate Production"]

[Text] According to the plan, 609 automated control systems for technological processes and new general-purpose computers will be commissioned in 1984. In the fourth year of the five-year plan provision has been made for increases by a factor of 1.3 in the production of instruments, means of automation and computers based on microprocessors. The output of industrial manipulators (robots), which will exceed 11,000 units, is being intensified. Flexible technologies, whose improvement depends largely on the instruments and automatic devices, will be used extensively.

The Soviet instrument making industry is called up to play a major role in implementing the CPSU Central Committee and USSR Council of Ministers decree "On Measures To Accelerate Scientific and Technical Progress in the National Economy." The development and production of instruments and means of automation at the level of the best up-to-date models are aimed at radically improving the productivity of social labor.

In his speech to electors comrade K.U. Chernenko noted that "it is absolutely essential that we insure a rapid and uninterrupted renewal of all sectors of the national economy on the basis of the modern achievements of science and technology. This is a basic task for us. Without this, progress in society is inconceivable."

Instrument makers are called upon to raise the technical level of computers, instruments and means of automation on the basis of the latest achievements of microelectronics, optical electronics and laser technology. The production of high-speed control and computer complexes and peripherals and software for them, electronic devices for control and telemechanics, servo mechanisms, and instruments and sensors for comprehensive automation systems for complex technological processes, units, machines and equipment, is being developed at preferential rates.

During the 11th Five-Year Plan, the production of measuring and monitoring equipment for automated control systems for energy use, and also instruments and means of automation for quality control of agricultural output, and for

other sectors, has been organized at enterprises of the Ministry of Instrument Making, Automation Equipment, and Control Systems. Instrument makers will be making a major contribution to implementation of the country's Food Program and Energy Program and to increasing the production of consumer goods.

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CSO: 1823/277

## INDUSTRY PLANNING AND ECONOMICS

### MINSTROYDORMASH PLANT TO MODERNIZE ITS CAPITAL EQUIPMENT

Moscow STROITEL'NYYE I DOROZHNYYE MASHINY in Russian No 4, Apr 84 pp 2-3

[Article by A. A. Tkachenko, chief of the All-Union Production Association Soyuzstroymashavtomatizatsiya, in the section "Implement Decisions of 26th CPSU Congress": "Some Specific Features of the Technical Re-equipment of Minstroydormash Enterprises in 1984-1985 and for the Period up to 1990"]

[Text] Enterprises manufacturing construction, road and municipal machines are engaged in systematic, purposeful efforts to enhance the technical standards of their production facilities. This work is regulated by the Branch Comprehensive Target Program "Technical Re-equipment of Enterprises of the Industry."

The Comprehensive Target Program's main objective is implementation of the decisions of the 26th CPSU Congress, which call for raising the effectiveness of production and its intensification. The basic indicators of greater production efficiency are higher labor productivity and lower specific material, fuel and energy costs in building machines.

The Comprehensive Target Program drawn up for the 11th 5-Year Plan orients the industry's executive and engineering personnel on the most expeditious solution of this problem through:

Development and improvement of primary materials production;

Improvement (optimization) of the inventory of basic production equipment;

Enhancement of technological equipment of machine-building processes to achieve projected labor-intensity;

Reduction of manual labor on the basis of mechanization, automation and robotization of production.

These basic guidelines are formulated in subprograms which provide for the required design work, allocation of funds, reference quotas for achieving specific plan indicators, etc.

The Comprehensive Target Program is based on the integrated-target method of planning the technical development of enterprises, which pools all forces and

means for the purposeful and accelerated enhancement of the technical level of production. Fulfillment of the program is discussed quarterly at meetings of the board.

The decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures for the Further Acceleration of Scientific and Technical Progress" called for the adoption of a whole range of practical measures aimed at raising the technical standards of new machines and their production. In the light of the program of accelerated scientific and technical progress, what new requirements should be imposed in implementing the Comprehensive Target Program to assure the accelerated enhancement of the technical level of machine production? In the first place, it is necessary to take a new approach to the elaboration of technical re-equipment projects with an eye on concentrating on the application of state-of-the-art production processes and equipment to specific conditions; a rational attitude must be taken towards building up the inventory of machine tools, with emphasis on extensive, universal introduction of no- and low-waste technologies and automation of all production processes on the basis of the introduction of automated equipment, robotics complexes, and computer technology, including microprocessors.

It is necessary to develop and improve primary materials production, making the maximum use of state-of-the-art equipment and new technologies, to assure the manufacture of precision blanks. For that it is necessary to review earlier plans of technical re-equipment of existing foundry and forge shops so as to assure the creation of capacities for the manufacture of precision blanks.

It should become a rule that blanks with the smallest allowances determine the choice of the most acceptable technology. Precision blanks can, however, be produced in machine-assembly shops by replacing inefficient general-purpose metal-cutting machine tools with state-of-the-art shaping equipment and introducing such new metal-saving techniques as extruding, rolling, knurling, drawing, etc.

Currently many factories of the industry have extensively introduced numerical control (NC) machine tools, including multi-purpose machines (machining centers), which successfully replace general-purpose equipment in small-series production.

The structure of metalworking equipment should be improved along two main lines:

By increasing the relative share of shaping equipment;

By filling the inventory of metal-cutting machine tools with highly efficient state-of-the-art equipment and increasing its share in machining processes.

In view of the series and small-series nature of production, the basic technology must be flexible and based on automated equipment and robotic complexes. The machine-tool inventory must be upgraded along with accelerated enhancement

of technological equipment through priority enhancement of capacities and volume of production of machine attachments and special tools.

In foundry production, the main task boils down to rapidly increasing the output of precision castings by state-of-the-art methods, which should contribute to reducing labor-intensity in machining processes. The output of precision castings must be increased by 1990. An important trend is increasing the precision of castings made in loam molds, primarily by improving the quality of molding flasks, cores and other equipment.

Press forging facilities must be developed and improved between 1984 and 1990 by setting up specialized facilities for the manufacture of precision forged blanks, the universal introduction of parts-making machine tools, cold heading and semi-hot extrusion equipment, etc. Increasing the output of precision forged blanks will make it possible to conditionally release machine-tool operators and machine tools.

In blank forging, the period up to 1990 should see more extensive introduction of advanced production process and equipment aimed at reducing waste and labor intensity. The volume of processing of sheet metal by advanced methods should more than double by 1990. Thus, plans provide for increasing the output of blanks and parts from strip coils, and of ring- and flange-type parts by the edge bending method, mastering the manufacture of parts by the rotary extrusion method, manufacturing mass consumption items (shovels, kitchenware, etc) by strip metal stamping in automatic complexes, manufacturing parts in small-series production by the method of step-by-step processing and shaping by local loading (spherical motion stamping, radial reduction, etc.), etc.

Implementation of this program in 1984-1990 will make it possible to cut down waste when manufacturing parts from sheet metal and reduce labor intensity.

Improvements in the structure of the inventory of metal-cutting equipment will have a great impact on reducing the labor intensity of machining processes. The branch program of optimization of the inventory structure provides for increasing the share of state-of-the-art machine tools in the industry to 30.6 percent in 1985, including highly productive machine tools (NC, automatic, specialized, standard-unit, and other machine tools) up to 19 percent.

The main direction in the development of metal-cutting technology should be the maximum possible concentration of machining operations in one machine tool. This would make it possible to reduce time required for auxiliary operations and raise the productivity of machine-tool operators by multi-machine servicing. In addition to the introduction of multipurpose machine tools of the "machining center" type it is necessary to modernize existing single-purpose machine tools, such as lathes, by providing them with attachments for performing milling, drilling, grinding and other operations.

The planned reduction of the inventory of metal-cutting equipment (reduction of jobs) should be justified in the specific conditions of factories by engineering estimates, supported by corresponding requests for highly produc-

tive equipment, and ultimately made the basis of the program, "Optimization of the Inventory of Metal-Cutting Equipment for the 12th 5-Year Plan."

Along with further introduction of continuous production, automated and semi-automated lines, and integrated mechanized shops and sections, it is necessary to provide for the introduction of fundamentally new types of complexes of machining equipment, flexible production systems on the basis of robotized NC machine tools connected by automated transport facilities of the automated roller system (ARS) and automated robotics machining complex types, automated specialized complexes on the basis of machining centers of the automated casing machining system (ACM) type, robotized, automated, rapidly readjustable lines and sections on the basis of standard-unit multiple-position machine tools with flexible transport systems, etc.

Their introduction is justified by the consideration that the growth of machine-building output at existing plants should be achieved with the same, or even fewer, number of workers, as applied to series and small-series production, which accounts for the bulk of the industry's output of finished products.

Flexible manufacturing systems (FMS) are an effective means of automating series production which ensures going over from one type of output to another with minimal expenditure of time and labor. The use of FMS's will make it possible to substantially reduce the demand for skilled workers, metalworking machine tools, and factory floor space, and improve quality; it also will provide personnel with the opportunity to more effectively use NC machine tools.

As Soviet and foreign experience shows, in FMS's consisting of NC machine tools and control computers which are serviced by automated accumulator transport and industrial robots, more efficient utilization of NC machine tools increases their productivity 1.5-fold as compared with the aggregate productivity of the same number of separate NC machines. Savings in the aggregate cost of machine tools and relevant cutting tools and attachments fully or partially make up for the costs of computers and the means of automation of auxiliary operations. Along with substantial increases in labor productivity they make for an economic gain of 150,000 to 800,000 rubles (depending on the number of machine tools in the FMS, production specifics, and the level of automation).

The field of most efficient application of ARS- and ACM-type FMS's is small-series and single-item production in which the nomenclature of machined parts varies extensively, and which accounts for approximately 33 percent of all machine-building output. Some 300 readjustment operations per machine tool required every year for an average production batch of 20 to 30 parts (ARS) emphasizes the need to ensure greater production flexibility.

Organizations and enterprises of the Ministry of the Machine Tool and Tool Building Ministry have developed and introduced into production a number of systems designed for machining of turning blanks, which employ industrial robots to mount the workpieces on the machine tools.

ACM-type FMS's have been developed for machining prism-shaped casings.

ARS- and ASVR [automatic computerized control system]-type systems perform turning, drilling, milling and grinding operations; ACM-type systems are provided with drilling-milling-boring centers. All production and auxiliary operations are automated.

Production control, preparation and accounting is done by computer.

There are also provisions for organizing series production of robotized complexes consisting of one or several machine tools of the same technological designation serviced by one industrial robot. These complexes, designed for turning, drilling, milling, boring and finishing operations, form the basis for setting up FMS's. It should be noted that the Experimental Scientific Research Institute of Metal-Cutting Machine Tools Scientific Production Association has drawn up methodological recommendations and technical manuals for standard ARS-type FMS's.

Thus, evaluating the attained technical level of production and its impact on accelerating the launching of series production of new machines, it should be noted that the upgrading of technology is a priority undertaking for every enterprise and the industry as a whole. The ministry is, together with the enterprises, systematically and purposefully upgrading the machine and machine-tool inventory by increasing the share of, in the first place, highly productive automated equipment (FMS's, machining centers, NC machine tools) and by developing capacities in the industry for considerably increasing the output of machine-tool attachments.

Raising the technical standards of production is the basis for reducing the time needed to prepare for the production of new machines and ensure their high quality. With the aim of building up the machine-tool inventory and preparing the technological equipment already during the initial stage of developing a new machine, the board of the Ministry of Construction, Road and Municipal Machine Building has made provisions for implementing a number of organizational measures aimed at reducing the deadlines for launching the output of new machines. They include:

Simultaneous (parallel) pursuing of work on designing machines and manufacturing procedures within the framework of the approved target program for the development of new machines and in strict accordance with the requirements of the branch system of technological preparation of production.

This will make it possible, already during the stage of elaborating the technological assignment for designing new machines, to formulate, along with indicators of the technical standards of items, indicators of the technical level of production, including the level of standardization and restrictive lists of attachments and materials, projected labor intensity, and the corresponding technological equipment indicator; the metal utilization coefficient; the volume of deliveries of standardized units from specialized enterprises of the industry, etc;

Introduction of statutes of responsibility of the organizations designing new machines for the technical level of production of plants that will manufacture those machines by raising the technological standards of newly designed assemblies and machine parts.

In this, the application of computer techniques and development and introduction of an automated system for preparing the production of new machines can become an important lever.

The measures taken by the industry to realize the comprehensive plan of measures aimed at accelerating scientific and technological progress and implement the measures and assignments of the Branch Comprehensive Target Program, "Technical Re-equipment of Enterprises of the industry," will make it possible to reduce the time required to prepare the production of new machines and be the industry's practical contribution towards implementation of the Decree of the CPSU Central Committee and the USSR Council of Ministers on the acceleration of scientific and technical progress.

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CSO: 1823/242

INDUSTRY PLANNING AND ECONOMICS

BRIEFS

PLANT, INDUSTRY MANAGEMENT--A new book entitled "Intensification in the Use of Production Capacities in Machine Building" has been published (Moscow, Mashinostroyeniye 1983, 184 pages). Among the extensive range of questions concerned with improving efficiency in industrial production, problems of intensification in the use of the industrial potential that has been created attracts the special attention of scientists and practical people. These matters are dealt with in R.G. Manilovskiy's book. On the basis of analysis and generalization of experience it is shown that the fullest use of production capacities makes it possible to achieve the best technical-economic indicators. The book explains the present-day methods used in machine building for determining production capacities and an analysis is made of factors influencing their formation and development, and these factors are classified and their interconnections revealed. Experience is cited in the use of mathematical-economic methods and computers in machine building for calculating optimal production plans for individual enterprises and for the sector as a whole. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 16, Apr 84 p 7] 9642

CSO: 1823/283

ROBOTICS

VERSATILITY OF NEW EAST, WEST EUROPEAN ROBOTS VIEWED

Moscow NAUKA I ZHIZN' in Russian No 11, Nov 83 pp 58-63

[Article: Parade of Robots"]

[Text] In the two previous articles the NAUKA I ZHIZN' Journal described Soviet robots shown at the "Avtomatizatsiya-83" Exhibition, and several robot equipment complexes created on their basis. In this number of the journal, the parade is concluded by robots of foreign manufacture which were exhibited at this international exhibition (kinematic arrangements of the robots are given beside the photographs).

Trade -- Painter

Bulgarian specialists created the RB211 industrial robot to free man from working in an environment saturated with paint and varnish vapors, harmful to him, as well as in the processes of sandblasting and shot-blasting parts. They also make it possible to automate the application of thermal insulation, powdery coatings and other coatings. A portable version of the manipulator which has a considerably expanded working zone was developed to paint large parts and articles. The robot is easily incorporated into automatic lines. If it is necessary to paint several parts of various configurations simultaneously, the robot is equipped with a recognition system.

The manipulator has six degrees of mobility. The robot is trained by an operator who guides its actuator manually along the desired trajectory. This motion is memorized and is automatically reproduced in the process of operation according to the instructions of the control device whose memory may contain up to 65 programs. The maximum lifting capacity at the end of the brush is 15 kilograms, while its maximum velocity of motion is 2 meters/second.

Over 100 such robots are in operation at enterprises of the Soviet Union, particularly in a number of automobile plants.

## Flexible Assembly Systems

The main feature of the "Pragma A 3000" robot, made by the Italian Firm of DYEA, is that it is designed not with a predetermined configuration, but as a machine consisting of basic units, -- a control cabinet, a set of manipulator arms with a set of clamps etc. By combining these units with assembly tables, devices for feeding parts, transporters and other fixtures, it is possible to create automatic assembly sections optimally adapted to the specific conditions of the production technology. At the section, the robot executes all operations for assembling the product in sequence, step-by-step according to the given program. Flexible automated assembly lines are formed from such sections and are linked together through a central control post.

The arms of the robot have three degrees of mobility. However, their number can be increased to five by using additional rotary units. The butt-joining unit at the end of the arm makes it possible to install changeable clamps. The manipulator can operate with parts weighing up to 2.5 kilograms and move (along guides on rollers) with a velocity of up to 40 meters/minute. The accuracy of executing the motions is very high with deviations not exceeding 0.025 mm. The arm may be equipped with a sensor that can provide information on the clamping force.

The "Pragma A 3000" assembly sets have a very flexible system of programming and control, reliability and high productivity. Thus, an automatic line which has 14 mechanical arms can assemble 180 automobile engine cylinder block heads, with each head consisting of 147 parts.

## Assembler and Monitor

The RNM robot of the "Robotron" Firm (GDR) cannot lift more than 250 grams. Yet this automatic desktop manipulator is by no means a toy. Its possibilities are wide, primarily in precise instrument building, in producing printed circuits, in an industry that manufactures various office machines, particularly typewriters, where it executes not only assembly functions such as stacking, loading, installing parts, tightening screws, -- but also monitoring. For example, it transfers parts to the measuring device which reports the measurement results to a microprocessor which issues instructions to one of the storage devices (according to the class of tolerances) that must deliver this product to the robot.

The arm of the robot consists of articulated levers and has five degrees of mobility. The levers are moved by step-by-step drives. The robot is programmed by training with a control panel in a dialogue method between the operator and a microcomputer which is guided by a display. The system of robot control is positional and contour.

## Tool Control and Loading

The "Fortshritt" Plant ("Progress in translation) is known in the GDR for manufacturing agricultural machines. However, recently it has also begun to make robots. At first they made them for their own needs to increase labor productivity in their shops and improve working conditions, but later, the robots became an independent product supplied to markets.

Along with technological operations such as, for example, welding, gas cutting, shot-blasting and cleaning castings, the "Fortshritt" IR 10E robot can also perform various complicated tasks on moving parts and intermediate products. Such universality is achieved by a multi hinge structure of the manipulator (it has five degrees of mobility) and the possibility of positional and contour control of its motion. An original control device (IRS 650) was developed for these robots by the "Karl Marx" enterprise. The dialogue between the operator and robot in the process of its programming is by means of the display. The lifting capacity of the robot, including the weight of the clamp itself, is 10 kilograms. The manipulator structure was lightened by making the body units from aluminum alloys.

## For Processing Centers

The West German Firm of IROBOS (acronym formed by German words; industrial robot equipment systems), exhibited a processing center with IRS L200 robots. Here the robot loaded parts on machine tools and unloaded them after machining. In combination with devices for transporting and storing parts, this robot makes it possible to solve various automation problems of small and large series production efficiently. The robot can operate in rectangular or cylindrical systems of coordinates; it has three or four degrees of mobility and a lifting capacity of 20 kilograms. A single or double clamp can be installed on the robot. The robot is programmed by manual training from the control panel.

## "PUMA"

This is the name of a robot series manufactured by "Nokia," a Finnish Firm (under license from the American Firm "Unimation"). The smoothness of its motions reminds one of the supple and graceful movements of the predatory puma. Actually, its name was formed by the first letters of the English words, "programmable universal manipulator for assembly." The use of high precision gear drives, precision position sensors with high torque DC motors, determined the reliability of these robots and the great accuracy of their action. Thus, in the "PUMA" 550/560 (demonstrated at the exhibit), deviations from given coordinate motions do not exceed 0.1 mm. A special language (VAL) was developed to program the "PUMA" which eases the introduction of programs while training and is done by an extension panel or by a terminal. It is precisely the flexibility of programming in combination with the articulated design of the manipulator that has provided these robots with a wide range of application: assembling parts, loading-unloading and packing operations, welding and other technological processes.

### At High Speeds

In flexibility of movement, the "Skilam" SR-4 (Japan) multiarticulated universal assembling robot is comparable to a human hand but is considerably faster. The maximum moving speed of the robot is about 1.4 meters/second. It moves smoothly and precisely with position deviations not exceeding 0.03 mm. The lifting capacity of the robot is 5 kg at low speeds and 0.5 kg at maximum speeds.

The robot is easily programmable due to the use of a special relatively simple robot language. Five different programs can be stored in the memory of the control microcomputer. A change to operation according to a new program occurs almost instantaneously. The robot is trained from a panel equipped with a TV monitor.

### Giant Machine Tool Operator

The impressive size of the PRO 30 robot, created by Polish specialists, is not accidental: it is designed to service machine tools with intermediate products weighing up to 30 kg and at a somewhat reduced moving speed -- up to 60 kg. At the end of the manipulator arm which has four degrees of mobility, various clamps with hydraulic drives can be attached, depending upon the configuration of the transported parts, in particular, double clamps. In this case, the robot, headed for the turning machine tool, carries the intermediate product in one clamp while the second free clamp removes the already machined part.

The operating cycle of the robot is programmed by the training method by an operator from a manual panel. The sequence of characteristic points on the arm motion trajectory and their coordinates are stored in the memory of the position control system (as in machine tools with ChPU [Numerical Control]. A written program can be scanned on the display. A hydraulic device for operating the manipulator is built into the base.

### Machine Tool Servicing

A Czechoslovakian Industrial Automation Plant in Presov manufactures the PR-16P robot to service production machines and machine tools. This automatic manipulator, built on the modular principle, operates in the cylindrical coordinate system; its arm has three degrees of mobility and the hand -- two. The robot can move parts and intermediate products weighing up to 16 kg. It moves at a speed of 0.4 meters/second in the vertical direction and 1 meter/second in the horizontal direction. The positioning error, i.e., deviation from given coordinates does not exceed 0.2 mm. The robot can make a full turn around the vertical axis in four seconds and the hand with the clamp can be just as fast. Stop cams limit the motion of all moving parts of the robot. The training of the robot, i.e., the program of its operating cycles is done manually from a control panel; the program can be introduced by punched tape or by computer. The robot can be automatically controlled by a given program. It can be fastened rigidly to the floor or installed on a mobile cart.

### Eight-armed Manipulator

The "Kadratic 745" (of the French firm "Cormel'") is thus named for its shape (translated from the French -- square), is designed to automate assembly work in mass production. It can be used in machinebuilding, in the automobile, electric equipment, electronic and other sectors of industry. Up to eight working heads can be installed on a ball bearing cart moving on guides up to 1 meter/second. The heads can, for example, weld, solder, tighten screws, use the laser for processing, assemble parts and transport them. By combining such heads and changing their programming, it is possible to execute a wide range of operations with high precision and in the needed sequence. The maximum transported weight (head and part) is 15 kg. The robot can execute 1500 to 2000 various operations per hour. The "Kadratic" makes it possible to create flexible automated systems.

### Simplicity and Precision

The W500 industrial robot built by the English firm, Wickman Automation, has three degrees of mobility and operates in the cylindrical system of coordinates. It is used widely in assembly operations in manufacturing automobiles. It can manipulate parts weighing up to 5 kg. Movements in the horizontal directions are about 1 meter/second, in the vertical direction -- 0.5 meter/second, and angular velocity is 90°/second. In training the robot, which is done from a control panel, the desired trajectory of the arm movement of the manipulator is divided into 300 to 500 points; their coordinates are coded and recorded on tapes. The design of the manipulator is such that the positioning error does not exceed 0.1 mm. This is achieved by using very precise drives without air gaps: ball and screw -- for vertical and horizontal movements of the arm and a wave gear drive for turning the arm, as well as by using low-inertia high torque DC motors.

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CSO: 1823/68

## ROBOTICS

### KIROV PLANT'S TROUBLES WITH ROBOTIZATION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 Apr 84 p 2

Article from Kopeysk and Moscow by SOTSIALISTICHESKAYA INDUSTRIYA staff correspondent V. Zenkovskiy in the column "New Technology: Level and Efficiency": "Invisible Robots"

Text In shop number 16 of the Kopeysk Machine Building Plant imeni S. M. Kirov there is a small section, the output of which is in tremendous demand among miners. Cutting points for the working elements of coal cutter-loaders are produced here. When production of these reached 2 million pieces per year, it became clear that automation could not be avoided in the future. Management decided to seek the assistance of science. The request of the machine builders was taken to heart at the Moscow VNIITuglemash Institute All-Union Scientific Research and Technological Design Institute for Coal Machine Building, and leading specialists were sent to Kopeysk. After studying the situation on the spot, they concurred: The manual labor on the cutting point line really is a bit too much for a century of technological progress. "It is necessary to robotize it," they recommended. Thus was born contract number 604, in accordance with which the institute took upon itself the obligation "to create an automated system for machining RKS-1 cutting point holders, including 12 robot machine tools."

The promised manipulator arms arrived in Kopeysk at the start of the 11th 5-Year Plan, and their developers soon followed them. The latter, together with the factory's specialists, equipped semiautomatic lathes with automatic devices. To the considerable amazement of the clients and the contractors themselves, the iron arm turned out to be slower than the human. Twenty seconds were lost in the manufacture of each cutting point. And the caprices of the iron arm were discovered from the first days also: It broke down at the drop of a hat.

"First the machine tool would fail, and then the manipulator," shop chief P. Petrov reluctantly remembers of that time. Production in the section began to drop. In the 1st year, operating 5 robot machine tools, the output of cutting points dropped by 200,000. In the following year, when yet another 3 machine tools were equipped with manipulators, production fell by another 100,000 cutting points. During this time, 20 of the 24 lathe operators working in the section were let go, and 5 foremen were replaced. The once leading shop began to fall short of the plan regularly, firmly took its place among the lagging, and lost

the title "collective of communist labor." Since there was no way it could fall behind any farther, factory management decided to reject the manipulators and equip the section with six-spindled semiautomatic lathes. As soon as the robots were carried away "feet first," things went well. At the end of last year I encountered a smiling shop chief P. Petrov.

"I consider the annual plan in the bag," he said in explanation of his cheerful mood. The output of cutting points has increased by 200,000 pieces for the year! True, we haven't yet reached the level of the year 1980, but that's not alarming. Everything will fall into place."

So that's the story. At the factory they now prefer not to remember what took place. Many factory specialists, with whom I had occasion to talk, are of the same opinion: They say no one is immune to errors and failures in science and industry. And Deputy Chief Technologist N. Vorotnikov stressed the following about the matter:

"The machine tools with manipulators weren't scrapped, but were sent to the PTU vocational and technical institute. They'll continue to work on them there."

I saw these machine tools. Sparkling with various colors of paint, they stood side by side along a wall, iron arms unnaturally bent. Here and there the ends of cut off electric wires protuded from them. A year has passed since the equipment was removed from the shop, and a foundation has not even been placed under them yet in the institute workshop.

The deeper I got into this story, the less inoffensive it seemed. Readily identifying the first part of the story by the commonplace expression "No one is immune to errors," for some reason the factory specialists were silent about its second part--the necessity to learn from errors. And a lesson should have been learned, if for no other reason than that next year they face the prospect of introducing a more complicated and expensive robotized system on the production line for hydraulic cylinder rods. The first effort cost the factory 130,000 rubles, whereas the cost of the new system will be 380,000. In the future it is intended to robotize an additional number of produciton sections. Meanwhile, no analysis of any kind has been made of the reasons for failure at the factory. Consider what, at least to me, is such a confusing fact: 8 manipulators were installed, and not 12 as were intended by the plan. Why?

"There wasn't enough room," P. Petrov answered simply.

In other words, an error which would have prevented the line's attaining assigned productivity even if all else had been in perfect order was tolerated in the plan from the very beginning. But why did it occur, and whose fault was it? No one found the time to look into this. The losses incurred through installation and removal of the equipment, reduced output of cutting points and instability of personnel are unknown. They were just written off without even an attempt at interpretation. But can it be an analysis was made by the developer, VNIIPtuglemash?

They speak enthusiastically and in detail about robots at the institute. For a beginning, I. Entin, chief of the department of research and design, outlined their origins, and then he shifted to the main concern.

"The main concern," he emphasized, "is the program of robotization of industry, within the framework of which we work."

The program truly is impressive. In it there is specific designation of exactly what kind of robotized system will be introduced where and when for all plants of the VPO "Soyuzuglemash" [All-Union Coal Machinery Industrial Association]. It is worked out to the year 1990.

"Thanks to such an approach to the problem," summed up. I. Entin, "we have had no gross miscalculations in introducing robots."

Looking into the faces of my conversation partners, I tried to ascertain whether or not they knew about the incident at Kopeysk. Then I asked:

"And what about the robots at Kopeysk?"

"As far as I know, two are in operation there," responded I. Entin. "The factory sent the rest to its vocational and technical institute. Another of our departments was concerned with them, so I can't say precisely."

The department of special technological equipment developed the robot machine tools for the people in the Urals. The chief of that department, V. Chernov, was categorical:

"We don't consider the incident in Kopeysk a failure. Favorable experience was accumulated during the operation time of the manipulators."

The meaning of this experience, however, still remained a mystery. All my attempts to get some kind of intelligible answer invariably were met by expressions of the following kinds: "Did the factory accept the manipulators. It did. Did it sign the certificate of introduction? It did. Did it seek assistance from us? No! So what else is required of us?!"

Still another question bothered me. In acquainting myself with the official accounts of VNIIPTuglemash, I discovered 12 manipulators, and not 8 as there were in fact.

"I don't know why there aren't 8, but 12, recorded in the account," answered Institute Director N. Batrakov.

A. Il'in, chief of the technical department of the VPO "Soyuzuglemash", lightly stroking the account book lying before him with his hand, said with deliberation:

"Right here is all the information about robots and manipulators functioning in plants of our association. During 3 years of the 5-year plan we have introduced 28 units. Certificates of introduction are available on all, and the total economic effect is calculated."

I acquainted myself with the accounts and was led to believe that 12 units of robot machinery installed in the Kopeysk Machine Building Factory imeni S. M. Kirov apparently bring in an annual profit of 24,600 rubles. I had to disillusion the chief of the technical department, and thereafter we performed some uncomplicated arithmetic operations together: To start with, we subtracted from the account data the four manipulators they didn't even try to introduce at Kopeysk, and then we took out the eight which were not suitable in the shop. The figure in the accounts, which sounded so good, literally melted before our eyes. A. Il'in couldn't say what condition the manipulators left behind are in, or whether or not they are operating.

"We have no information about operation of the manipulators," he said to explain his difficulties. "They don't send us such reports. Neither the factory nor the institute informed us of the incident at Kopeysk."

In this explanation, to my way of thinking, is contained the very missing link which will enable us to understand what happened: Forging ahead with introduction of the robots, the management of the factory, the institute and the VPO "Soyuzuglemash" worried least of all about the real output of this miracle of the 20th century. And when, instead of profits, the progressive machinery began to bring in losses, they tried not to notice the fact. This is when invisible robots began to stroll through the accounts.

The matter probably could have been dropped at this point, except for an unexpected continuation of the story. About 3 weeks after my interviews in Moscow, B. Granovskiy, a staff member of VNIIPTuglemash, telephoned the newspaper's Chelyabinsk contact point. "I have come to Kopeysk on behalf of the institute's management," he advised. "I want to turn new documents on the robots over to you."

I went to Kopeysk. B. Granovskiy, the chief designer of the project, solemnly handed me the still entirely fresh minutes, approved and certified by seals 2 days before, of a technical conference of factory and institute representatives organized "as a kind of author's review of the introduced... manipulators." Those lines in the minutes attracted special attention where it was said, "Seven automatic manipulators with semiautomatic machine tools 1A416 have been mounted in the workshop of SGPTU number 11 /SG vocational and technical institute, expansion of "SG" unknown/ with a guarantee of producing RKS-1 cutting point holders at the rate of 15,000 pieces per month." Now, I thought in amazement, that's good productivity! So I invited B. Granovskiy, the chief designer of the project, and N. Vorotnikov, deputy chief technologist of the factory, to accompany me to the institute's workshop and take a look at the manipulators in operation.

The workshop was vacant. All of the machine tools stood as before, with frames not fastened down. However, three of them seemed to be connected to electric power lines. It was evident that the machine tools were not installed as they should be, were not adjusted and were not ready for operation. Nonetheless, they tried to start the first in line. On the second part the mechanical arm had already lost synchronization. Thus N. Vorotnikov and B. Granovskiy were compelled to acknowledge that the minutes, to put it mildly, outstripped actuality. Once again the inclination to substitute a good sounding report for actual fact had prevailed.

And what, I asked Chief Factory Engineer Ye. Kiselev, is the outlook concerning the new robotized system that must go into operation next year?

"Is that," he sought clarification, "the one on hydraulic cylinder rods? There won't be any."

But, I said, it's in the program!

"Do you know how that program was drawn up? Whoever is producing some kind of robot machinery gave VNIIPTuglemash a prospectus. Together with the institute, we selected components and defined suitable robotized systems. When our specialist decided to submit an application for it to the indicated address, he was told: 'The equipment you need does not exist. It has not yet been developed.' So much for its introduction."

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## ROBOTICS

### ADMINISTRATIVE OBSTACLES TO ROBOTIZATION RECALLED

Leningrad LENINGRADSKAYA PRAVDA in Russian 1 Jun 84 p 2

/Article by S. Pochin: "Eighteen Candidates for an Unprestigious Job"/

/Text/ "Sorry, you do not suit our needs," said the chief designer with extreme delicacy, summarizing the conversation.

"How is that?" said the visitor, stunned. "Are my questionnaires in order?"

"The questionnaires are in order, but...."

"Then please tell me who does suit you. Perhaps you are waiting for a Nobel Prize winner to answer your announcement? You are waiting in vain, for he will never come. You will not attract anyone even with humbug about a robotization bureau."

"What do you mean humbug?"

"What good are robots in a handicraft industry?"

"You still doubt? That is exactly the point. So long! By the way, we have long since stopped being a handicraft industry...."

So it was, time after time; 17 attempts to select an engineer-electronics specialist for the firm ended in failure. I asked Saveliy Yakovlevich Kiperman, chief designer of the Metalloposuda Association, and Yevgeniy Mikhaylovich Godun, supervisor of the introduction brigade: "Was it necessary to organize a formal written examination for the job candidates? What is the need for such strictness when the enterprise is certainly no LOMO /Leningrad Optical-Mechanical Association/ and no 'Svetlana'?"

"There you go asking about that," sighed Godun sadly. "Look, how are we going to attain the level of LOMO and 'Svetlana' if we take just anyone who shows up? And will we be accomplishing a lot if the worker selected is scornful of the enterprise from the very start and does not consider his job particularly prestigious?"

"Well then, what sort of a person do you need?"

"A competent specialist, technically erudite. That, however, is not the problem. There are now many such people. What is needed is a person who is caught up in his work, who is able to dream and think boldly."

"We did finally hire such a person," beamed Kiperman. "Yes, he was the 18th.... How is he working out now? I hesitate to praise him too much, but give him our work for tomorrow today. He will not settle for less."

Just 5 years ago, such a conversation could perhaps not have taken place at Metalloposuda under any circumstances. At that time, there was still no concern about robots. Engineers-electronics specialists were not in demand. There was no need to put up announcements inviting them to come work.

We will not be hard on the firm. The problem of robotization was at that time a far-away fancy not just for local industry. But the important thing is that this collective was among those able to respond expeditiously to the new trends that are fundamentally changing the character of production. In a short time, it was able to go from plans to the practical assimilation of up-to-date means of automating manual labor.

There are a number of obstacles along this path, which is nothing new for anyone. But the managers of the firm, the engineers and the workers not only ran up against technical "reefs" and financial "shoals." Forward progress was constantly held back by the extreme caution of various departments and partners toward the aspirations of the collectives: is it not too much, the work costs a pretty penny, even the giants cannot manage right away.... Again and again, it was necessary to prove oneself, to demand that one be taken seriously: after all, we are producing goods for the people, not trinkets!

"Even after we had practically obtained the first four robots," remembers general director E. V. Evdokimov, "we almost lost them. Someone calculated that the manipulators allocated to us were more useful elsewhere. In the organization upon which the matter depended, they tried in every way to demonstrate that it was not yet time for us. I remember how I blew up then. No, I did not pound my fist on the table. And what does the responsible worker's wife use for boiling cabbage soup? I asked right out. And how is the laundry hung? And how is water carried at the summer cottage?"

"And how did he respond?"

"That he carries the water himself. In short, the problem was solved happily for us then. But it should always be that way."

I do not think that there can be any doubts about the correctness of the general director. It may well be that every family in Leningrad has something from among the 122 articles produced by this enterprise. Without them, there would be a noticeable shortage in the economy.

Without the enameled pots, the teapots, the cans, without the bowls and saucers, finally, without the clothes pins, of which the city needs millions every year. By no means every family, however, has these articles in the needed quantity, the store counters are still not overloaded, and demand is not being met fully. Thus the striving of the Metalloposuda collective to increase the rate of production, to re-equip it and to incorporate highly productive equipment is fully understandable. These efforts require total support.

Nevertheless, the unavoidable question is whether there are guarantees that such support will not be as water in sand, that the technology has been entrusted to reliable hands. In the experimental section of the chief designer's department, they made made it clear that there is no reason to be concerned in this regard.

"Without the good, one makes do with the bad," joked the workers. For many years, the enterprise was on a starvation diet, as they say. We were not spoiled by any special technical generosity "from above." In such a situation, like it or not, the "gray matter" forced us to work all out. We always thought of something, we modernized and created things ourselves.

Naturally, it is difficult to express in words that atmosphere of creativity and complete lack of dependency. Even insignificant details can say a lot. For example, the look of confusion on the faces of fitters not able to give a working demonstration of the just-created automaton. Something did not work right, the electronics refused to cooperate, the rotor mechanism broke down, and V. Barinov and B. Aronov could have died of shame. They were not about to resort to explanations or trumps to cover this chance interruption, for thanks to the automaton 2.5 million bucket handles--the annual program--will be produced in a few days.

"Enthusiasm and obsession, that is all well and good," the captious reader will say. But is it now so that Metalloposuda is just taking advantage of this enthusiasm and obsession? Is it not so that in crying "hey, we can handle it!" they think that they can solve all problems of technical progress? Those are reasonable questions, entirely appropriate, for it is often that way. But I think that things are different at Metalloposuda. It has happened that here as well they have approached the outlined goals with an "overexpenditure" of the intellectual, nervous and physical energy of people. However, the persistent striving of the party committee and the administration to bring about a precise organization of creative work has been reducing these irrecoverable expenditures to a minimum.

Let us say that they put an end to the tactic of "patching holes," under which the technical services are sent mainly to places where the program is "urgent." They began to resist "rush work" on a planned basis. As at other enterprises, they obligated all shops to announce their intention at the beginning of the year to eliminate "bottlenecks," but the peculiarity of these announcements was that they included literally all wishes.

"It seems that they have applied the ancient principle 'ask for something impossible and you will receive the maximum.' Is it not so?" I asked Evdokimov with interest.

"It seems so," he answered, not adopting the playful tone. "I will just add that our shops strive to demand the impossible mainly of themselves. That is one thing. In the second place, even the most hopeless wishes, at first glance, will certainly be reflected in the overall program of action. The technical services have been denied the right to say 'no' and that makes one think.

An automaton for molding cans once seemed totally unrealistic, but the workers of the mechanical shop gave the designers an order: "make a wonder-machine." Two years passed--not such a long time--and the desired machine is operating. Since April it has been producing one can every 20 seconds. And it is not at all surprising that designer V. N. Sychev and brigade leader E. S. Godun call it a captured phoenix, for among the ideas floating in the air, they and their comrades were able to take and carry out one that put the automaton on a par with the best foreign models.

The economic side of things is also impressive. Due to the innovation, the production of 3-liter cans at the enterprise will increase by a factor of 2.5 this year. Just as effective are many other steps taken by innovators at Metalloposuda. During the last 5 years, for example, the number of workers involved in the production of enameled dishes decreased from 400 to 300, even though there was a significant increase in production. They were again helped by equipment made by their own hands; they are now able to manufacture and put into operation at the association as many as 15 automatons and semiautomatons per year.

They once bent metal over their knees here, and they gave it the required form on their stomachs. Such primitive production methods are now a thing of the past. The enterprise earned the right to be trusted not through muscle power but through the force of collective creativity. And it is quite legitimate that the last year or two have brought the firm a noticeable increase in opportunities to purchase up-to-date technical means. The appearance of the robots-manipulators is evidence of that.

Such a turn of events did not catch the people by surprise. They waited for it long and patiently. They immediately entrusted the concern about the most rapid assimilation of new equipment to a creative introduction brigade that they formed specially. The technical side of things was handled by specialists of the already-organized robotization bureau. By the way, it was there that the engineer-electronics specialist was needed.

They also thought through the strategy of using highly productive equipment. It was decided not to scatter it in several subdivisions but to concentrate it in one powerful hand. Thus the robotized stamping section was created. The collective now has plans to robotize the entire stamping shop. This is not a distant perspective; the installation of new manipulators will begin this year. A contract has already been signed for their delivery. A number of other changes are planned for the current Five-Year Plan.

It would seem that there is reason to conclude this article on a happy note. But it will be more proper to direct our attention to what has not been solved. For as before, Metalloposuda still has very great difficulty with serious steps toward retooling. They even have to seek help and support where one would not expect them to do that. For example, that new batch of 15 manipulators was "procured" at the VAZ /Volzhskiy Motor Vehicle Plant/, whereby the CPSU Oktyabr'skiy Raykom had an active part in the operational solution to this question.

The Leningrad giant enterprises still prefer to abstain from such solid help. They might manufacture a press mold or pass on a machine tool that is not really needed, but no more than that. To be sure, cooperation with local industry cannot remain that way. This was strongly emphasized in the obkom resolution adopted at the end of last year. But the important thing is that the experience of Metalloposuda and other advanced collectives clearly shows that a once-backward sector is now in need of help at the most up-to-date level rather than petty "charity." The sector is prepared to accept the help with authority and to respond quickly with a high output of goods that are still in short supply in the stores.

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CSO: 1823/269

## ROBOTICS

### ROBOTIZATION OF STAMPING OPERATION REVIEWED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 May 84 p 2

/Article by A. Valentinov, scientific commentator for SOTSIALISTICHESKAYA INDUSTRIYA: "Designating a Partner"/

/Text/ In this shop of the Leningrad Electrical Machine Plant /LEMZ/ presses were arranged in two rows, tirelessly stamping out component after component. But no people are seen behind them. Two-armed robots have taken over the monotonous and tiring manual operations. With one arm they put the blanks under the presses and with the other they pull out the finished items. And to the side, with flashing signal lights, stand blocks of control installations that synchronize the movements of the robots and presses.

"Unfortunately, we were not able to free ourselves of manual labor completely," said shop director I. Teplukhin, cooling my enthusiasm. "True, instead of 22 women stampers in this section, there are now only three workers per shift. Six for two shifts...."

"What do they do here?"

"They create normal working conditions for the robots," smiled Ivan Fedorovich. "They fill cases with stampings, set them up in the feed mechanisms and send the finished components to the warehouse. Of course, they, in contrast to the stampers, are not tied to the presses for the full 8 hours. They can take a break or exchange a few words. But the necessity of watching to be sure that there is no robot downtime makes their work stressful...."

"Nevertheless, six workers instead of 44 is not a bad result in robotization," I persisted. "Even counting the adjusters, it turns out that labor productivity increased almost four-fold."

"No, just by a factor of 1.5," answered I. Teplukhin. And he explained: "The robots have to be operated by highly qualified specialists. And they work more slowly than people. We purposely carried out comparative tests, asking one of the stampers, and not the best one, to work alongside the robot. And she easily outperformed

it, turning out more components in a shift, although she worked with breaks. On the average, the robots slowed the work pace of the presses to little more than two-thirds of what it was before."

"Why did you not put faster robots on the presses?"

"We took the ~~best~~ robots that we could get. And there is more to it than that," says V. Petrov, director of the robotization department at LEMZ, joining the conversation. "The main mistake was probably that we saw the robots as a replacement for human workers."

There is no need to judge the enterprise specialists too harshly. They themselves are critical in assessing the results of their efforts. One should not forget that LEMZ was not only among the first in the industry to incorporate robots but in the country as well. And it did not do it for reasons of prestige or because it was fashionable to do so, but proceeding from a true production necessity.

The problem began to arise 5 years ago when skilled stampers were leaving the section for a well-deserved rest, and young workers were in no hurry to replace them. The one way out was to turn their duties over to robots. And conditions were right for that. In Leningrad and the oblast, a regional robotics program was gaining strength. The wide incorporation of robots also began at enterprises of the Ministry of Instrument Making, Automation Equipment, and Control Systems /Minpribor/. In particular, on the minister's orders, six model robotized sections were to go into operation in the industry in 1983. Among them was the stamping section at LEMZ.

It did become a model in the sense that it clearly showed that the success of robotization depends not only upon improved technical decisions but also requires a fundamentally different work organization.

At Minpribor, they understood very well that it would be difficult for producers to accomplish the set task without the help of the industry science. Therefore, the order attached corresponding scientific-research institutes and KB's /design bureaus/ to each enterprise where sections were being organized. The LEMZ partner was the SKTB AP /special industrial design bureau with automated programming/ in Gomel'.

But the paradox is that having just worked out their relations with their partner, the producers clearly got in a hurry. Not waiting for science to investigate the section and give its recommendations, they formed a brigade from plant specialists. They drafted a plan themselves and began to introduce robots. Why? The plant specialists explain their position simply:

"If we had waited for science to get moving, it is uncertain whether the section would be operating today."

There is an element of truth in this criticism. The SKTB issued the results of its investigation in 1982 when robots were already working in the stamping section. LEMZ solved its chronic problem of a shortage of stampers. But the sluggishness of science led to the fact that in introducing the robots, the producers departed from one of the fundamental principles, the complex nature of automation. In their project, for example, they did not consider various systems that exclude annual operations. And SKTB AP specializes in the development of precisely these systems.

One could forget this story if LEMZ were not facing a complex task. In 1985, an automated stamping shop is scheduled to begin operations here. Without human participation, most operations, not just the basic ones but also auxiliary operations--right up to the transporting of components and stampings--will be carried out there. And, of course, better robots will replace those of today.

The partners of LEMZ in this task are the already-mentioned SKTB AP in Gomel' and the PKB /planning-design bureau/ in Cheboksary. And Giproprribor /State Instrument Planning Institute/ in Leningrad, the head institute for planning instrument-building plants, was also included. What sort of help are they giving producers? To receive an answer, I decided to call Gomel'.

"We cut our ties with LEMZ," was what I heard unexpectedly from N. Vinogradova, leading engineer at SKTB. "And the plant itself is to blame for that. We worked out the technology and began to plan the systems for case stamping and the line with transporting-orienting modules. But the plant was not able to find a manufacturer. In addition, it was not able to bring in the Cheboksary PKB. And our work has no meaning without its participation."

"The people in Gomel' have no basis for their claims," retorted S. Lyapunov, director of the Cheboksary PKB, when I related to him the content of this conversation. "We were prepared to perform our part of the work, that of planning mechanized warehouses and transport lines, if Gomel' would begin to do its part. A year ago, we concluded an agreement with the specialists at SKTB, but they did not meet the time requirements. And now the time has been lost and we cannot be involved in this work until next year."

It would appear that no comments are needed on these statements. But there is one detail that should not be passed over. Both partners see are their obligation only in the creation of individual elements of the robotized shop. But who will combine them into a single automated complex? Perhaps Giproprribor?

"That is not included in our task," explained to me condescendingly A. Anosov, chief project engineer. "We have to document construction work, energy supplies, financing...."

V. Smirnov, chief engineer at LEMZ, cleared things up. "We were forced to take upon ourselves the role of head organization, since all of the science organizations were trying to hide from one another. Giproprribor demanded that it be given technology, Gomel' pointed to Cheboksary, and Cheboksary pointed to the tardiness of the people in Gomel'. Somehow, however, we made them work. And we will insist that they finish the work. But we have to do a lot ourselves."

Naturally, this lack of coordination is only an episode in the life of the industry, where they consider robotization to be one of the main directions of technical progress and where they give it maximum attention. About 8,000 robots and manipulators are already operating at 137 enterprises of Minprribor. Nevertheless, as the example of LEMZ shows, even in this industry, the position of the scientific-research institutes and the design bureaus as well as the manner of their interaction among themselves and with the enterprises are in need of improvement. In talking with me, I Goloto, scientific administrator of the industry program, did not deny this:

"Yes, we know that our robotization of production is by no means following a straight path. Could miscalculations be avoided? I do not think so. In essence, the industry is in the learning stage of the introduction of robotics. We are only now beginning to understand many details of this process and there are a lot of complex problems in this area. One of those problems is that of the interaction of enterprises with science. The scientific-research institutes and the design bureaus are still not very interested in solving the concrete problems of the technical retooling of production."

"Ivan Danilovich, the producers consider that it is essential to have organizations that would work to solve the tasks of robotization, which means from the beginning to the end, from investigating the enterprises to the putting into operation of robotized production."

"We are creating such organizations. But to count on them alone is to lose time. It is essential for the enterprises themselves to be active and not wait for someone to do everything for them. For this purpose, the enterprise should have strong production-development services capable of solving at a high level the tasks of improving technology, with the emphasis on complex automation. Also needed are shops for the industrial preparation of production and for the fabrication of rigging, accessories and tools. In addition, many enterprises must grow up to the level of the demands made by robotics--to establish organizational and technological order, to improve the quality of components and to train specialists."

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CSO: 1823/273

## ROBOTICS

### ROBOT INTEGRATION PROBLEMS AT UKRAINIAN PLANTS RECALLED

Kiev RABOCHAYA GAZETA in Russian 24 Mar 84 p 2

[Article by V. Litvin, correspondent in Berdyansk, Zaporozhye Oblast, under the heading "Lessons of Economic Thought": "Robots Taking Exams"]

[Text] They didn't just enter our lives, they exploded into them from the world of fantasy and took their places at the machines, welders and on the assembly lines. And they offered their services in more than just the hard, hazardous jobs in modern production. The world's smallest robot is just 30 cm, and its only hand lifts just 600 g. But that's all that's needed. On a pharmaceuticals line, it puts labels on medicine boxes.

Is that all? In recent years, we have developed upwards of 200 different modifications of these metal "fellow-workers." Just in this republic, more than 20 institutes and design bureaus and 60 industrial enterprises are involved in developing them.

And quite naturally, robots are entering the plants increasingly confidently. There is a great need for them, as there are insufficient labor resources and since one in every two workers is still, unfortunately, employed at heavy physical labor and because, finally, robots never get tired.

But have robots always found a common language with people? Alas, no. Conflicts sometimes arise.

Let's say a Tsiklon-3B has been installed in the drop forging sector at shop No 19 in the Zhdanovtyazhmash association. At last, the stamp operators sigh, this laborious operation has been made easier. But the robot at first does not accept the blanks, because they are poorly made. Then it doesn't "like" the working conditions: high temperatures, and no interface made with the old equipment. And so the robot begins to annoy, instead of pleasing.

Here's an especially angry, and alarming, letter. "Dear Editors. Here in Berdyansk, we've promoted the Yuzhgidromash Plant as a model for introducing robots for two years now. I've been to the enterprise several times and learned from discussions with workers and engineering-technical workers that the robots there are for show and are switched on only for visitors from other enterprises, and even then, only with an engineer standing by. None of them have produced anything or are producing anything. Total losses. But to judge from the reports,

the robots have all but revolutionized production. The workers laugh at that, while the enterprise leaders keep on laying a smokescreen. Should that be called eyewash or a crime?"

An unavoidable question.

And so, I'm in Berdyansk.

Yuzhgidromash party committee secretary A. A. Berezan is happy to discuss his enterprise. "Get to know us a little better," advises Anatoliy Andreyevich, "and you'll see our robots all together."

I was really in a hurry to see them, and V. K. Kharchenko, chief of the department of production processes mechanization and automation, rushed me to the plant. We glanced at the color defectoscopy sector and passed through the finished products warehouse, passing through one shop after another.

"And the robots?" I prompted.

"Soon," said Valeriy Konstantinovich, and the "tour" continued.

Then, after several side trips, we finally encountered the "brigs," all six in one row. Each was attached to its machine tool and should have been machining the inside and outside of a bushing. But they weren't. The second and third complexes -- four robots -- were supposedly being adjusted. One other, poor baby, had a damaged "arm" and needed urgent assistance. The flame of life flickered only in the first complex. The robot masterfully grasped a part and fed it to the machine tool, which turned it, and the finished part was sent on. True, the work wasn't pretty, as the "arm" sometimes twitched, disturbing the rhythm.

"Hydraulics," explained Valeriy Konstantinovich. "It needs about half an hour to warm up."

So I understood then that the robot had just been switched on. Just to show the correspondent, of course. And incidentally, that wasn't done by an operator working there full time, but by V. V. Sokurov, a design engineer in the mechanization-automation department. Also deliberately, apparently, because he was terse. Lathe operator Yu. Z. Tadeush was much more open: "It's been idle for a week. No parts. I'm ready to ask them [to get rid of it]...."

Yurgel Zinov'yevich operates an ordinary machine tool. But when they began assembling the robots, he got actively involved in it, putting the subassemblies together himself. And when everything was ready, it was naturally transferred to the operators without hesitation. Still, it was interesting. The first few days, crowds of people gathered to look at the intelligent automata. But soon the unpleasantness began. They churned out blanks for a week, enough for two days work, then nothing. The last quarter of last year, half a month was lost, with a worker and two robots standing idle. So many breakdowns! And you're not going to find an electronics technician in a month of Sundays. And so Yurgel Zinov'yevich is worn out; he looks sadly at his Herculean machines and thinks: my nerves, though, are not made of steel. Sometimes they break down and he wants to send in an application to have them taken away. But deputy shop chief

A. M. Yefimenko listens and promises. Again, his discourse is optimistic. "Problems? There have been a few interruptions. There are enough blanks. True, there is some arrythmia, but in principle, everything is being resolved."

That is how he sketches his own mismanagement, the price of which is wasted working time and endless trouble for lathe operator Yu. Z. Tadeush.

Then we read in an official bulletin: "Three model Brig-10-ZAZ robots are now in operation. Two of them comprise a robot equipment complex loading semiautomatic lathes and one is for loading thread-rolling machine. They operate in one shift. Their introduction has permitted the hypothetical freeing of two workers for other jobs and an economic impact totalling 20,900 rubles."

Robots are not people. They do not blush with shame when embarrassed by such excessively high praise and imagined success. Nor are there tears of repentence. They do, however, bear a grudge against man in their electronic brains. They were installed to work, not to be on display. But who knows it? Another official document, setting a date for a robot-equipment meeting with the plant's chief engineer, V. G. Sidorov, states: "First complex, consisting of two Brig-10-ZAZ units and a semiautomatic lathe, is to be maintained in operating condition daily and is to have a stock of blanks." That is, it is not operated, but is in operating condition, in case of dire need.

For that reason, passers-by sometimes stop and stare at the "Brigs" in bewilderment. Beautiful, they say, powerful, they say, and probably expensive, but useless. One of those passers-by wrote the letter to the editors. Anonymously, unfortunately.

The "Brigs" at the Yuzhgidromash are in fact often idle: blanks for the parts often advance with interruptions, to put it mildly, the electronics running out here, there and everywhere.

"So what? I don't need that," says V. K. Kharchenko, chief of the production processes mechanization and automation department. "Let 'em break...."

And so, a second aspect of the problem opens.

V. K. Kharchenko has not held his position of chief for long. The department, whose basic task is the development and introduction of robot equipment complexes, was created on 29 June 1983 by Order No 483. And six people, united by a common idea, took up the task. They enlisted specialists from the Zaporozhye Technological Design Institute of Agricultural Machinebuilding and the VNIITnasosmash [All-Union Scientific Research and Technological Institute of Pump Machinery]. Sites and facilities were selected for robotization. The parts for the "Brigs" were manufactured jointly with 23 oblast enterprises. They were assembled at the Kommunar Association in Zaporozhye. And finally, they were delivered to the shop.

The real difficulties began then. Something malfunctions, and no output. The robots had to be dismantled and then reassembled. And still, they remained at odds with the machine tools. A huge amount of time has been spent on adjusting them. And it continues to this day.

In brief, quite a bit has already been done. In any case, considerably more than at other enterprises in Berdyansk. For that reason, the party gorkom uses the Yuzhgidromash as an example to those who, because of inertia, are not taking up this question at all. But not all at once, in one fell swoop.

"Someone from outside might snigger when he sees the idle line, not knowing that the technologists are working frantically on the problem," says plant chief engineer V. G. Sidorov in describing the situation.

And one must agree. Robots are not persuadable. They do not take root easily. And when they arrive at an installed production facility, they present a number of technical, organizational and psychological problems. These have appeared full-blown at the Yuzhgidromash association. Lathe operator Yu. Z. Tadeush, in particular, is acutely aware of them. He can correct a small malfunction himself: smart enough, as they say. But he's all thumbs when it gets more complicated. There are no adjuster specialists. Moreover, the old oversights of the middle management link in organizing production are taking their toll. There also arises sometimes a psychological barrier in the workers: doubts, a sense of "what's all the fuss?" and "can't we do without these 'electronics' for the time being?"

No, we can't. This same Yuzhgidromash Association already is short about 100 machine tool operators. And nothing is likely to change in the near future. There is a shortage of workers. And the production facility itself needs to be modernized. Automation, in the form of robots and manipulators, is needed. This all the plant's leaders admit. These questions have been raised repeatedly at party committee meetings. A slow train, but picking up speed.

One thing is disconcerting: the numbers in the reports are sleeker than the reality. This is both an emotional and an economic mistake: why embellish reality? There are robots, and there are difficulties. And we need not close our eyes to either, fooling either ourselves or others. We cannot keep pace with scientific-technical progress if our discipline and consciences are shaky. This is the first lesson offered us by the Yuzhgidromash management experience.

But there is another, which can be put this way: one robot in a shop is not an army. It is expensive, and the economic impact is, alas, not great. For full automation, we need not only manipulators -- one or several -- but appropriate production organization as well. This increases the cost of restructuring. Not surprisingly, only the large enterprises, which spend freely, have thus far accumulated positive experience. But that's the only way. Everyone who offers his hand to the robots must follow it. If this is done, the automata will be able to work every shift, not selectively, and will actually, not hypothetically, free workers for other jobs, as opposed to the Berdyansk experience.

And one final lesson. For production workers concerned about meeting plans, every technical experiment has some risk. One does not always manage to get through them without, as the chemists say, losing some substance. But let's not get upset at initial losses. The primary thing for managers is to gain time. Spend one ruble today, get 10 back tomorrow. It is to this end purpose that it pays to introduce robots.

And perhaps the robot equipment complex being kept in "operating condition" at the Yuzhgidromash is playing a positive role in these early days. Its easy, graceful movements are helping break the conservatism of economic thought among other managers, forcing them to believe in the power of the robot, and awakening the enthusiasm which is sometimes lacking when new equipment is introduced. And given appropriate support, the complex itself will start operating at full power.

The Ministry of Chemical and Petroleum Machinebuilding, to which the Yuzhgidromash is subordinated, recently created a new main administration, the Soyuzkhimmashtekhnologiya. It is called upon to reduce manual labor in the branch and must render the Yuzhgidromash concrete assistance in solving the pressing problems of training electronics specialists, mechanics and designers.

And, inasmuch as the Berdyansk workers are not alone in their concerns, the oblast methods commission on reducing manual labor should set up a consultation center to offer practical assistance to those introducing robots.

They are in no way guests at the enterprises, but more accurately are hosts. And they must be taken into account, listened to and their "requests" and "observations" responded to regarding where production needs to be restructured, obsolete equipment replaced, load maximized. We say robots are not a whim, but a necessity. They are reliable assistants. So let's not offend them.

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